



# What's Happening With Artificial Intelligence?

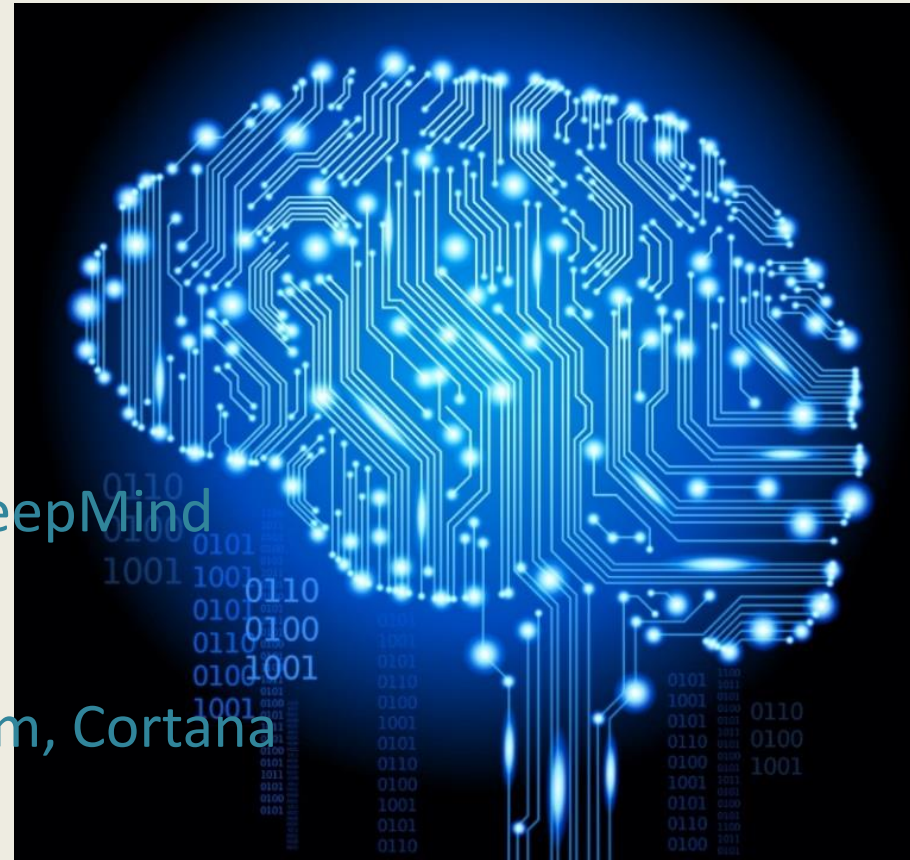
Steve Omohundro, Ph.D.  
PossibilityResearch.com  
SteveOmohundro.com  
SelfAwareSystems.com

<http://googleresearch.blogspot.com/2015/06/inceptionism-going-deeper-into-neural.html>



# Multi-Billion Dollar Investments

- 2013 Facebook — AI lab
- 2013 Ebay — AI lab
- 2013 Allen Institute for AI
- 2014 IBM - \$1 billion in Watson
- 2014 Google - \$500 million, DeepMind
- 2014 Vicarious - \$70 million
- 2014 Microsoft — Project Adam, Cortana
- 2014 Baidu — Silicon Valley
- 2015 Fanuc — Machine Learning for Robotics
- 2015 Toyota — \$1 billion, Silicon Valley
- 2016 OpenAI — \$1 billion, Silicon Valley





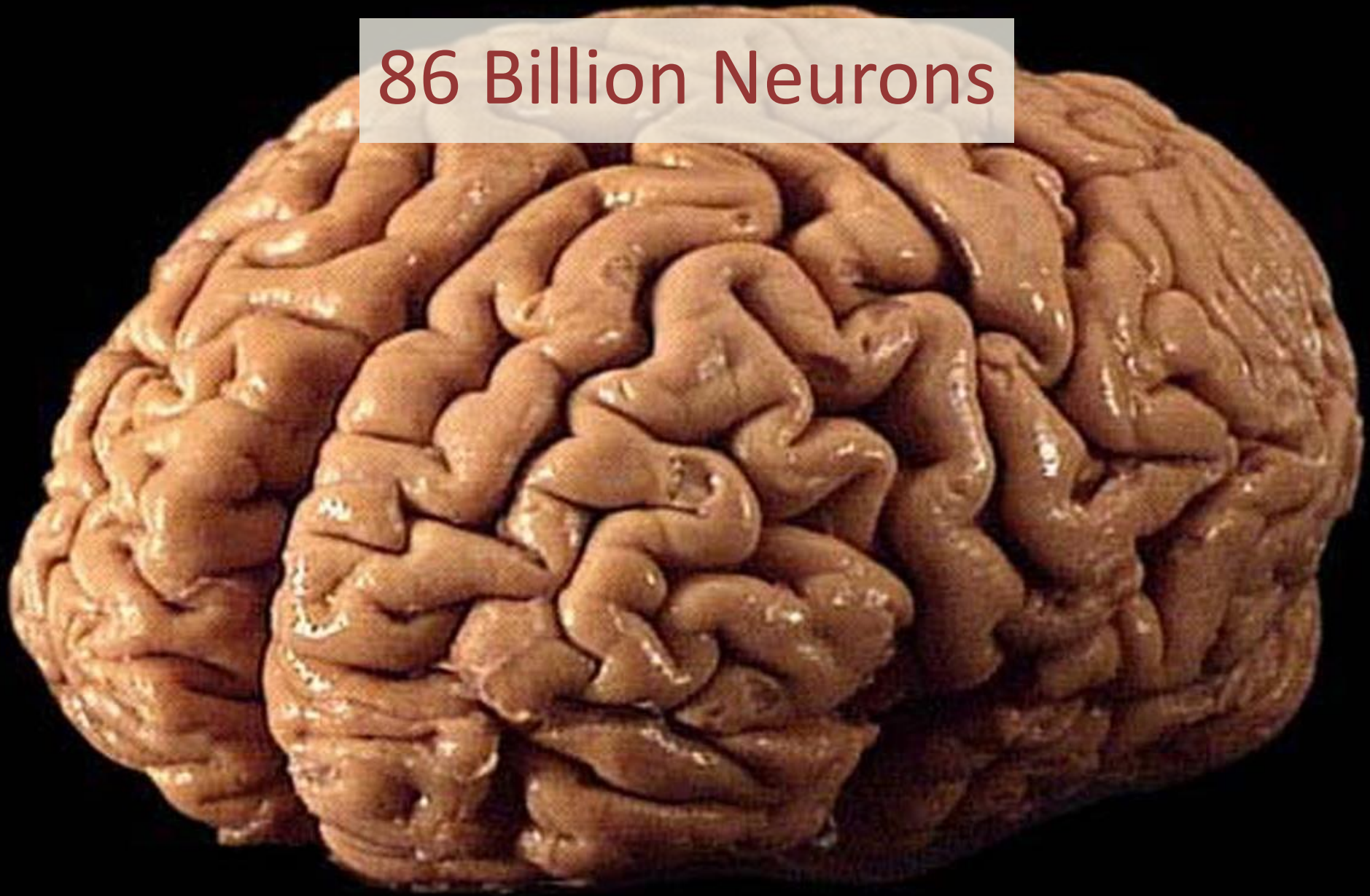
# McKinsey: AI and Robotics to 2025

\$50 Trillion!

US GDP is \$18 Trillion

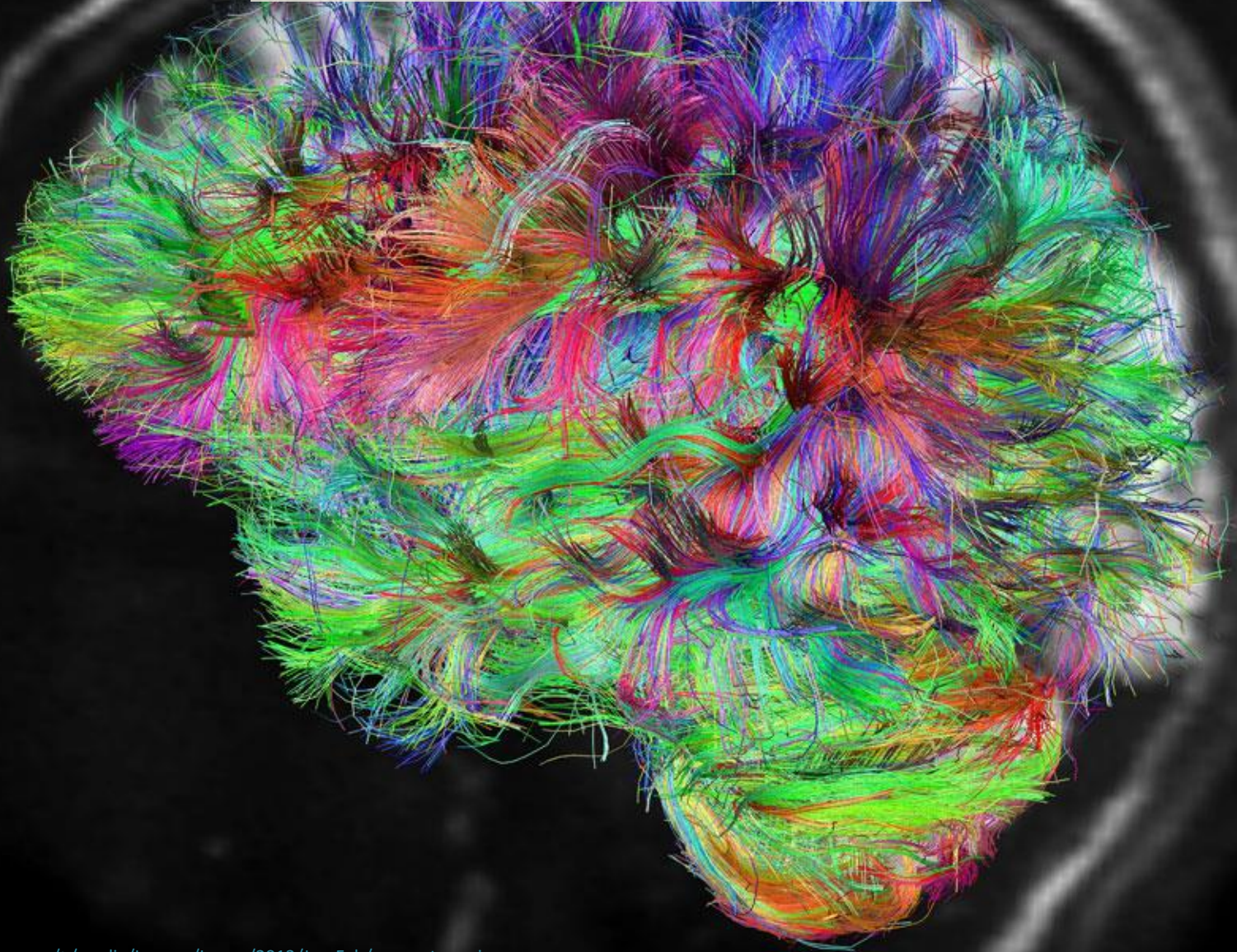


86 Billion Neurons





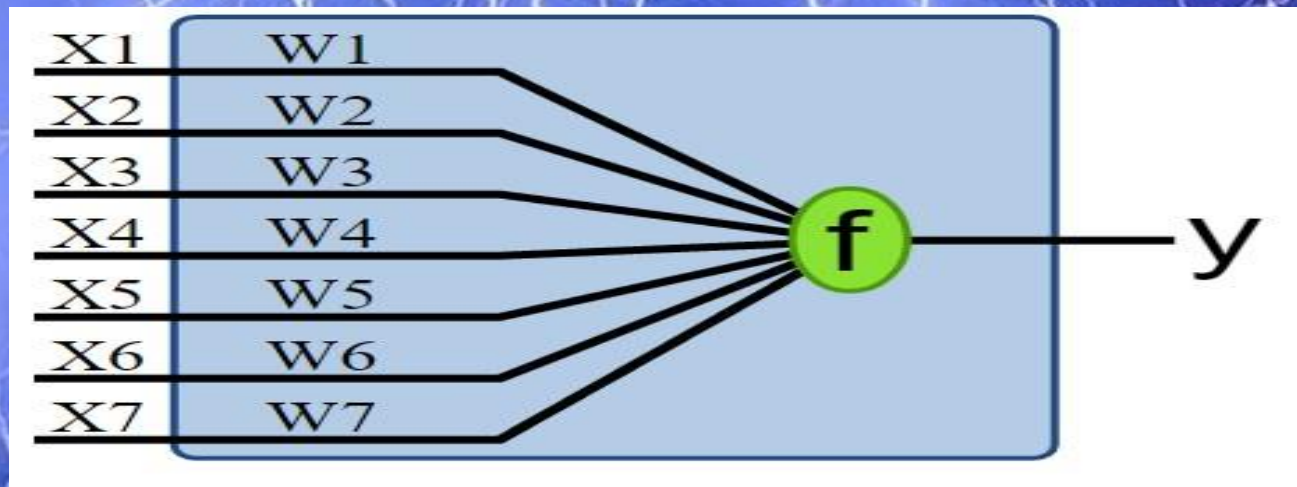
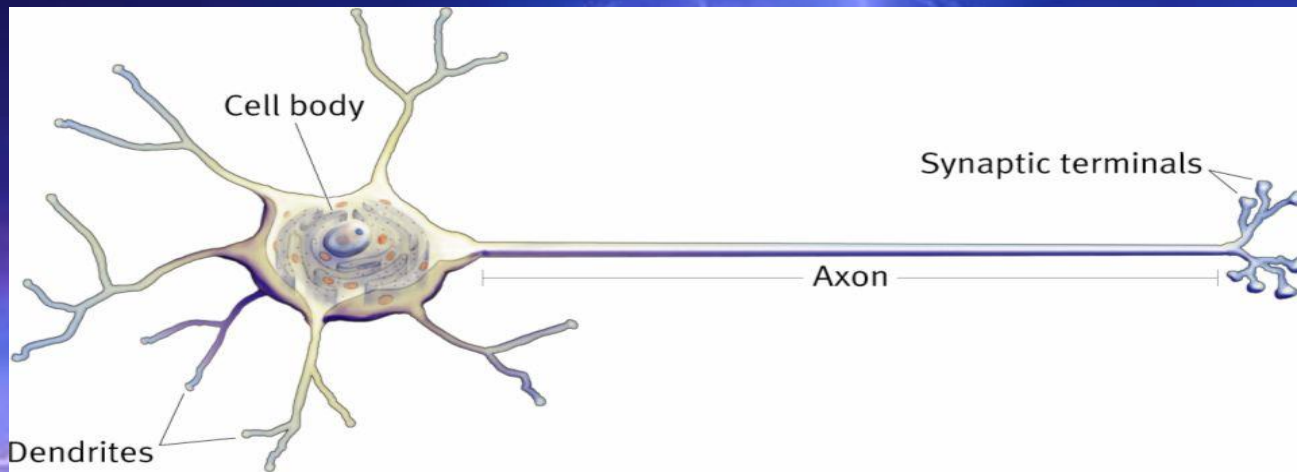
# The Connectome





# 1957 Rosenblatt's "Perceptron"

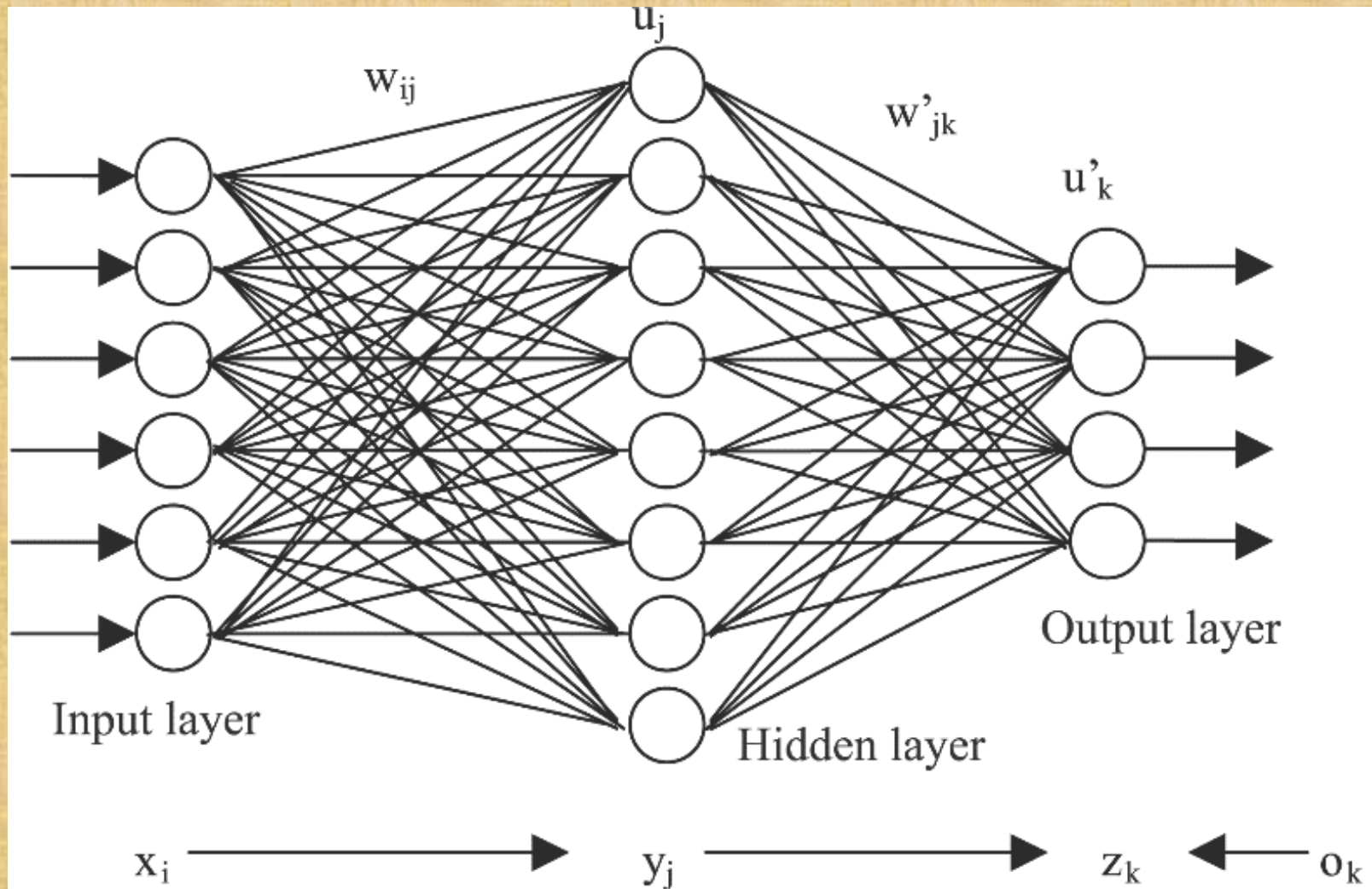




*“The embryo of an electronic computer that [the Navy] expects will be able to walk, talk, see, write, reproduce itself and be conscious of its existence.”*

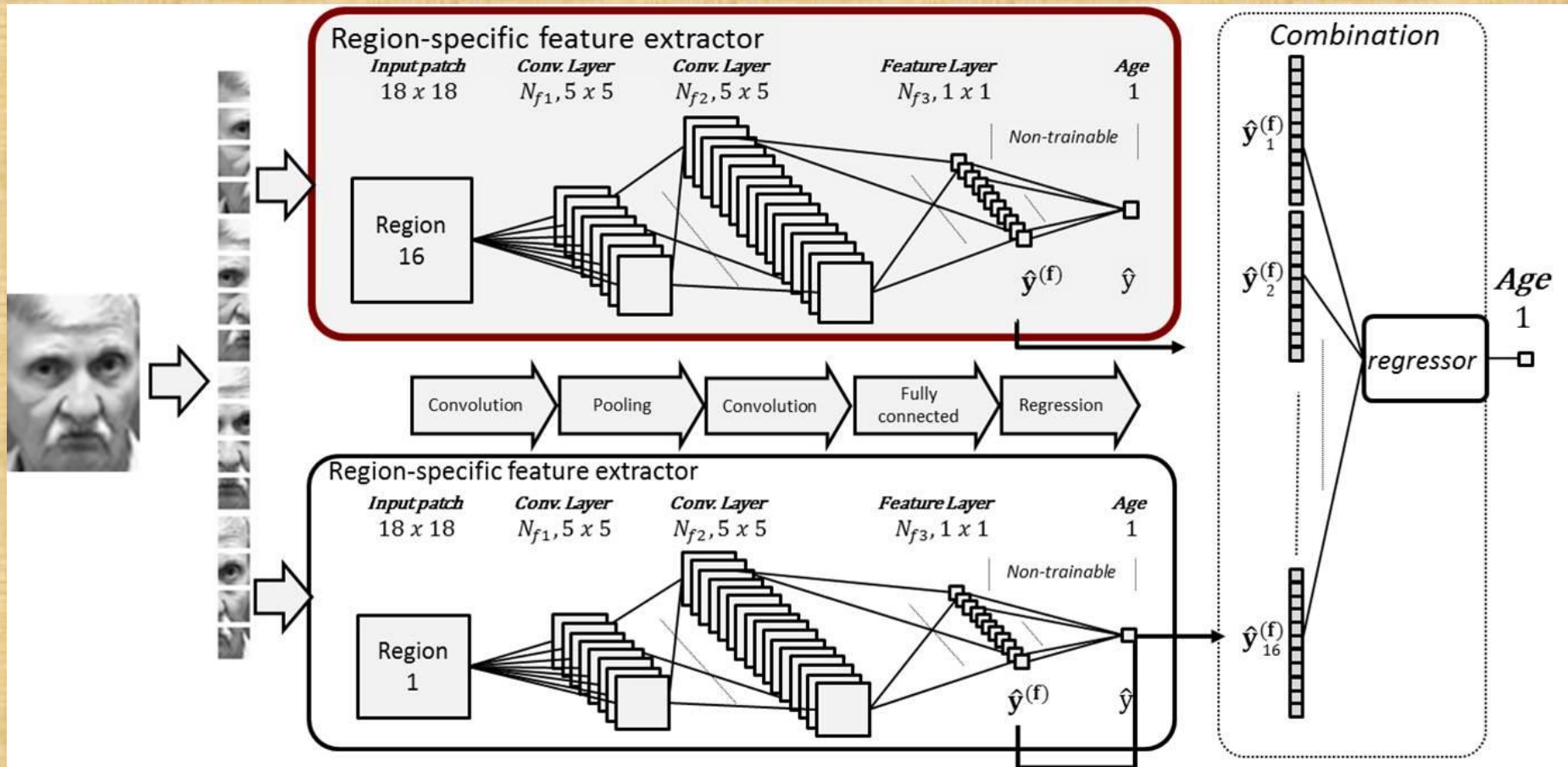


# 1986 Backpropagation





# 2007 Deep Learning





# Deep Learning Successes

- 2009 Speech Recognition TIMIT: Cortana, Skype, Google Now, Siri, Baidu, Nuance, etc.
- 2012 Image Recognition ImageNet
- 2012 Drug Discovery Merck Challenge
- 2013 Natural Language Sentiment
- 2014 Image Captioning
- 2014 Natural Language Translation
- 2015 Atari Video Games DeepMind





# 300 Deep Learning Startups \$1.5 Billion



**Venture Scanner**

<https://venturescannerinsights.files.wordpress.com/2015/01/artificial-intelligence-map.jpg>

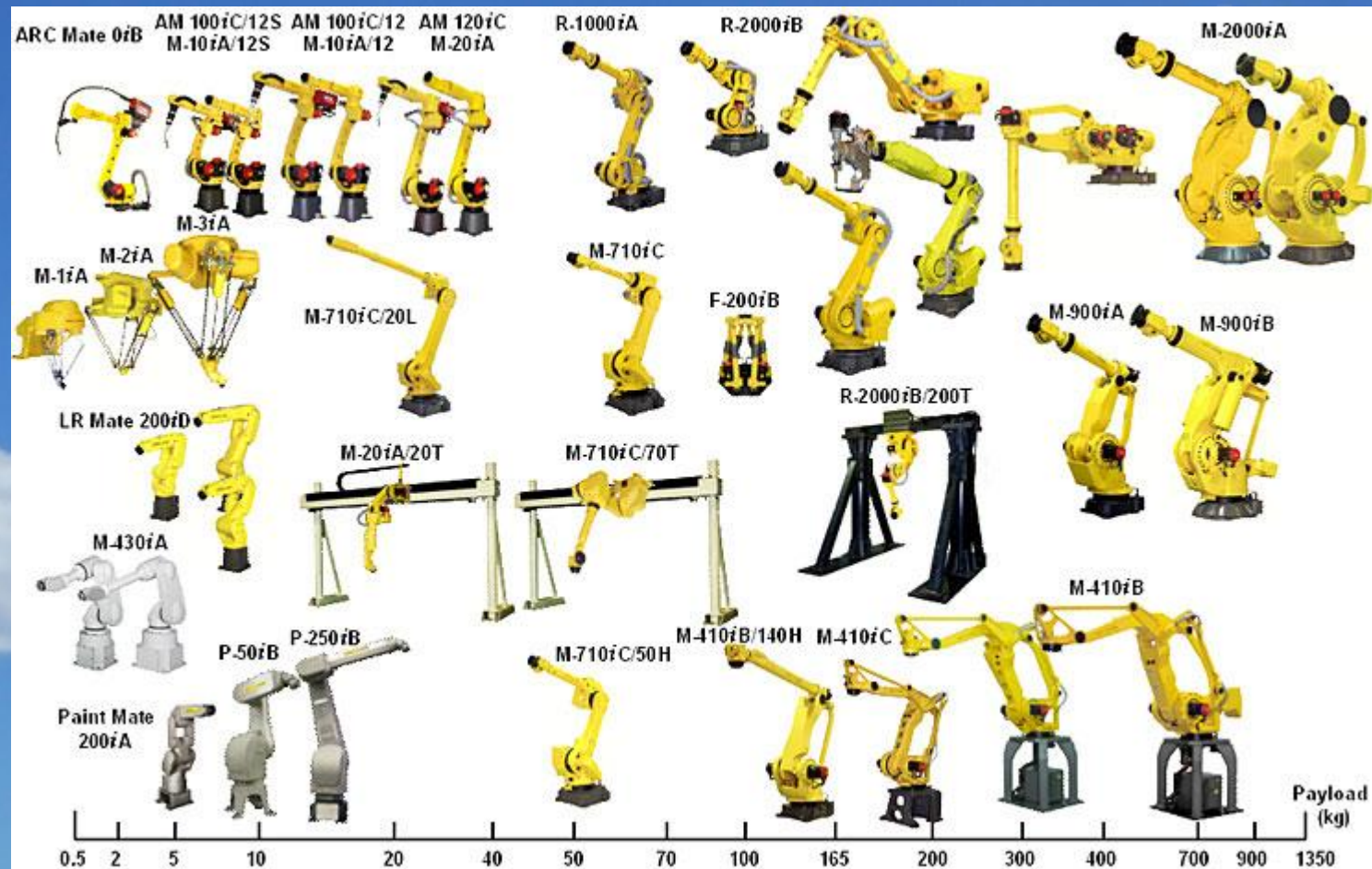


# Robot Manufacturing: \$10 Trillion to 2025

Work 24 hours/day  
No breaks, food, medical  
Don't quit, get bored, get depressed  
Work anywhere  
Hazards OK  
Don't leak secrets  
Work well with others  
Easy to replicate



# Dec. 2015: Fanuc Deep Learning Robots



*Deep Learning to Bin Pick in 8 hours*

<http://australianroboticsreview.com/wp-content/uploads/2015/08/Fanuc.jpg>

<http://www.bloomberg.com/news/articles/2015-12-03/zero-to-expert-in-eight-hours-these-robots-can-learn-for-themselves>



A close-up of a yellow industrial robotic arm, likely a KUKA model, positioned in a factory setting. The arm is yellow with black joints and cables. It is surrounded by various mechanical components and wiring.

# 420 Chinese Robot Companies

Two yellow industrial robotic arms are shown working on a car engine. The arms are positioned on either side of the engine, which is mounted on a white base. The background shows a factory environment with metal frames and safety barriers.

## 1500 Dongguan “Robot Replace Human” factories





# March 2015: China Brain

Robin Li Yanhong, CEO of Baidu proposed a state-level Chinese initiative to develop AI “comparable to the Apollo space programme”.

● LIFESTYLE • TECHNOLOGY • ARTIFICIAL INTELLIGENCE

## 'China brain' project seeks military funding as Baidu makes artificial intelligence plans

Robin Li wants China to become a world leader in artificial intelligence

**Bien Perez**

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UPDATED : Wednesday, 04 March, 2015, 1:10



Baidu founder Robin Li Yanhong speaks to reporters at the Great Hall of the People about his plans to develop artificial intelligence. Photo: Simon Song

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# Self-Driving Vehicles: \$10 Trillion by 2025

Disrupt Dealers, Insurance, Parking, Finance, Trucking, Taxis  
10 million jobs



<http://www.theverge.com/2014/5/28/5756852/googles-self-driving-car-isnt-a-car-its-the-future>  
<http://zackkanter.com/2015/01/23/how-ubers-autonomous-cars-will-destroy-10-million-jobs-by-2025/>





Tesla: “Autopilot” mode

Google: Fully Self-Driving in 2020

Mercedes, GM, Volvo, Apple, Uber,...

[http://en.wikipedia.org/wiki/Autonomous\\_car](http://en.wikipedia.org/wiki/Autonomous_car)

<http://zackkanter.com/2015/01/23/how-ubers-autonomous-cars-will-destroy-10-million-jobs-by-2025/>

<http://www.flickr.com/photos/quikbeam/6896564084/>





Uber valuation: \$70 billion, 20% of fares

<http://www.wsj.com/articles/ubers-new-funding-values-it-at-over-41-billion-1417715938>

World's largest job creator: 50,000 per month

<http://www.businessinsider.com/uber-offering-50000-jobs-per-month-to-drivers-2015-3>

Center for research on self-driving cars

[http://bits.blogs.nytimes.com/2015/02/02/uber-to-open-center-for-research-on-self-driving-cars/?\\_r=0](http://bits.blogs.nytimes.com/2015/02/02/uber-to-open-center-for-research-on-self-driving-cars/?_r=0)

36 second wait, \$.50/mile, 100% of fares

<http://zackkanter.com/2015/01/23/how-ubers-autonomous-cars-will-destroy-10-million-jobs-by-2025/>

UBER


[https://d185ox70mr1pkc.cloudfront.net/post\\_image\\_teaser/1403883171000-uber-force.png](https://d185ox70mr1pkc.cloudfront.net/post_image_teaser/1403883171000-uber-force.png)



# Nvidia outs Pascal GPU in new “supercomputer” for self-driving cars

Drive PX 2 has dual SoCs, dual GPUs: “the processing power of 150 MacBook Pros.”

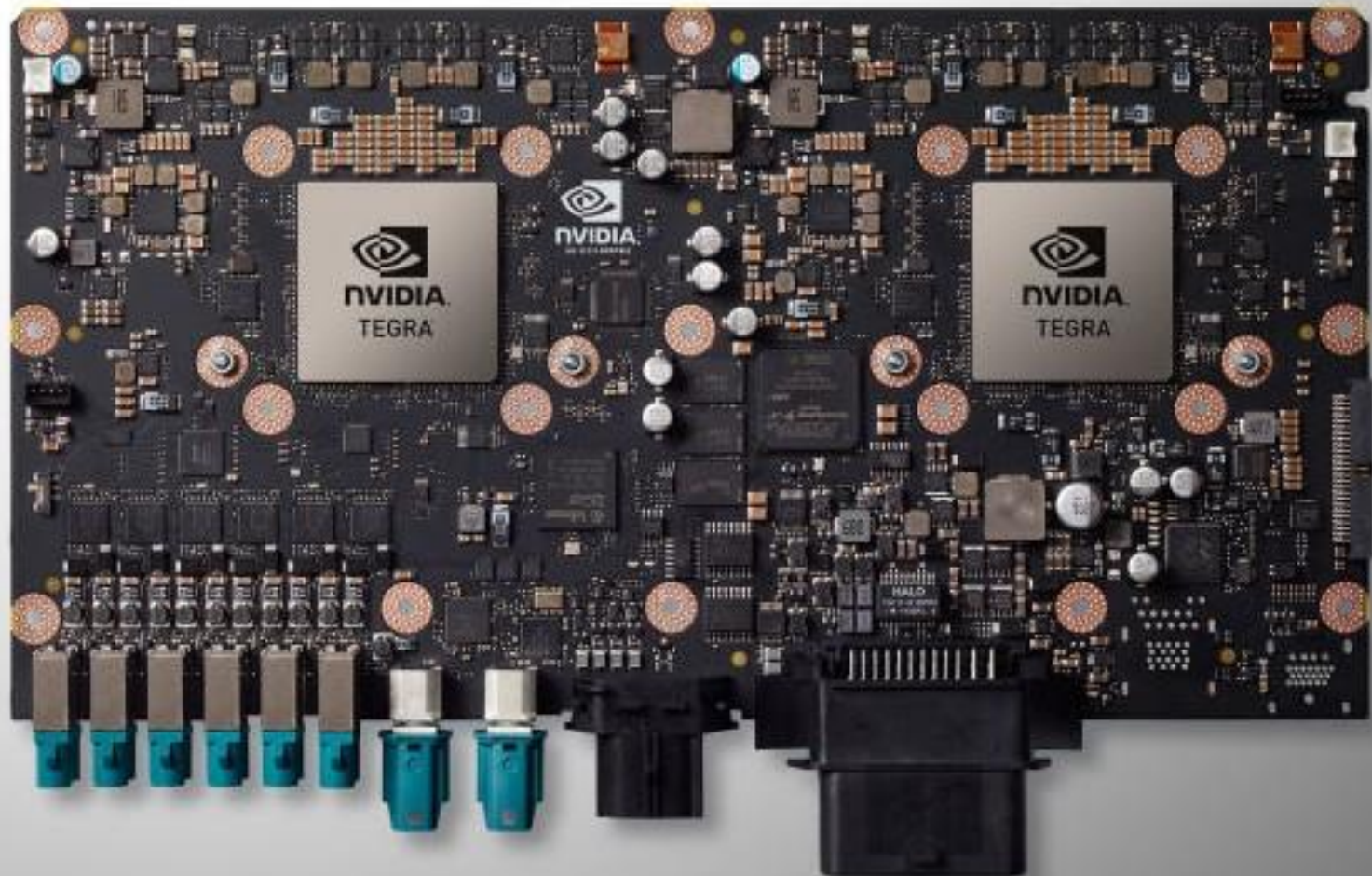
by Mark Walton (UK) - Jan 5, 2016 5:39am PST

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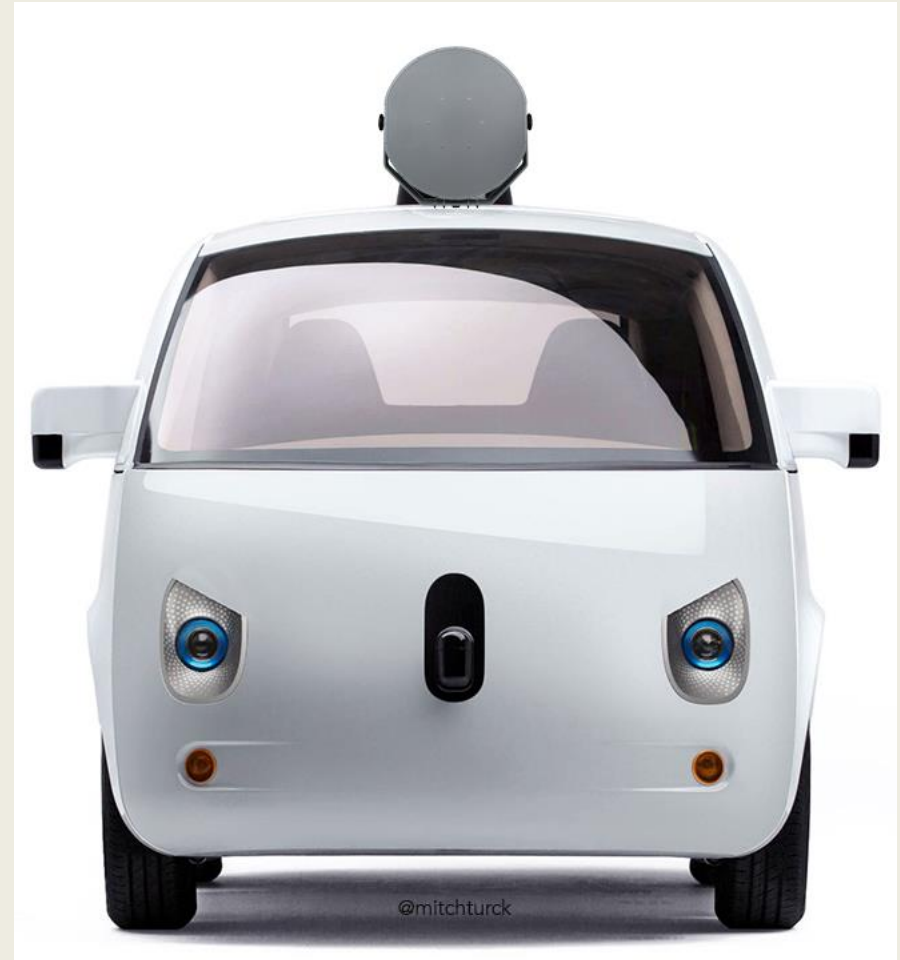


# Pedestrian Chicken

"We jokingly play chicken with them when we're trying to cross the street," he said. "You see one about to make a right turn at a light, and they're obviously trying to decide if we're going to step into the street or not. It's so tempting to sort of step toward the curb, which makes the car stop instantly and wait for you to go, except you don't go."

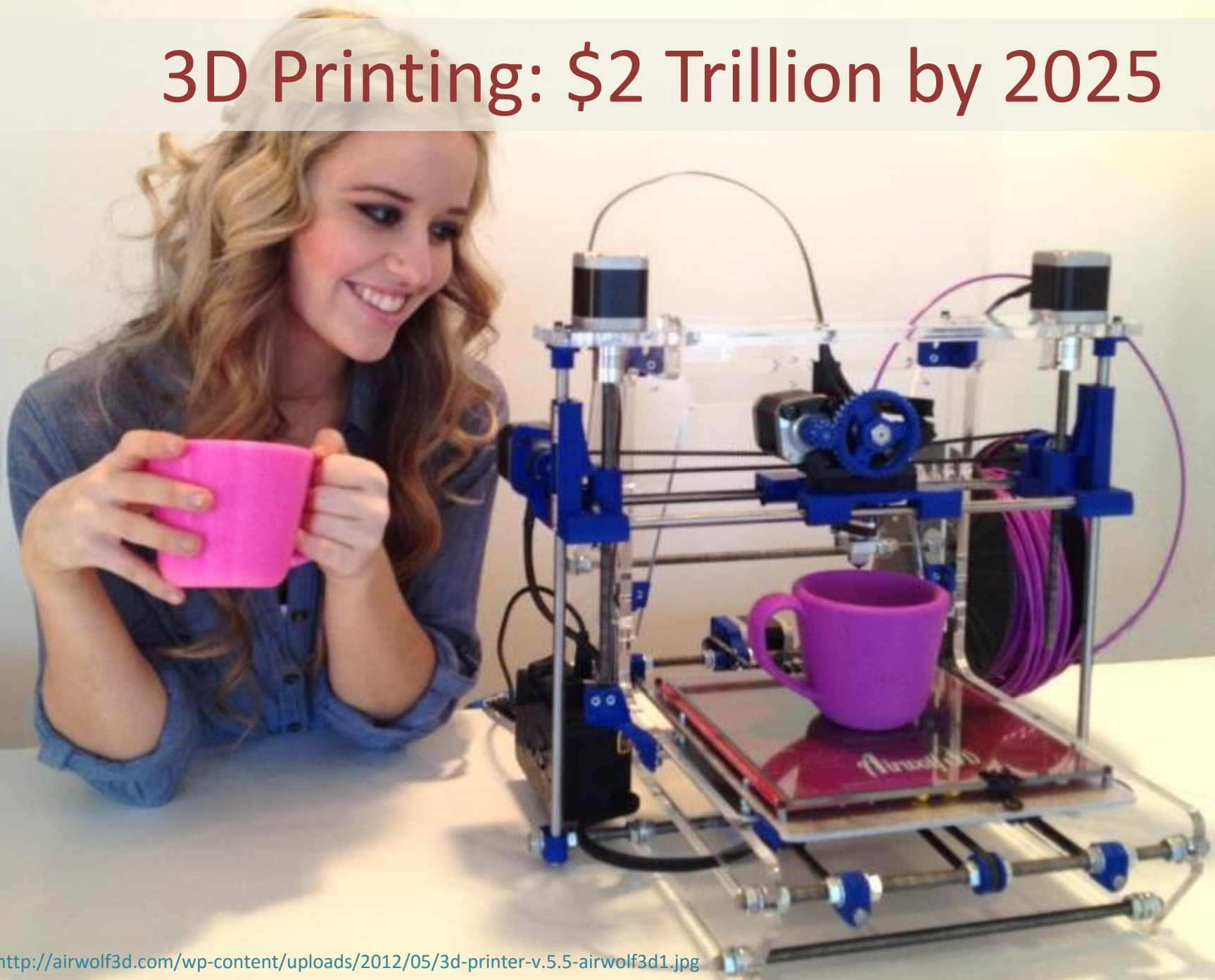
"We're just messing with it," he said, "to see what it'll do."

– Zandr Milewski





# 3D Printing: \$2 Trillion by 2025



# April 2014: Chinese WinSun 3D printed 10 houses, 2100 sq ft, \$4800





# WinSun 3D printed 12,000 sq ft villa

A large, ornate, white villa with a blue roof and a balcony, featuring a green banner on the balcony. The villa has multiple windows and a classical architectural style.

US Building construction: \$1 Trillion/yr  
5.8 million employees

# Nov. 2015: Kespry and Nvidia Deep Learning for Drones

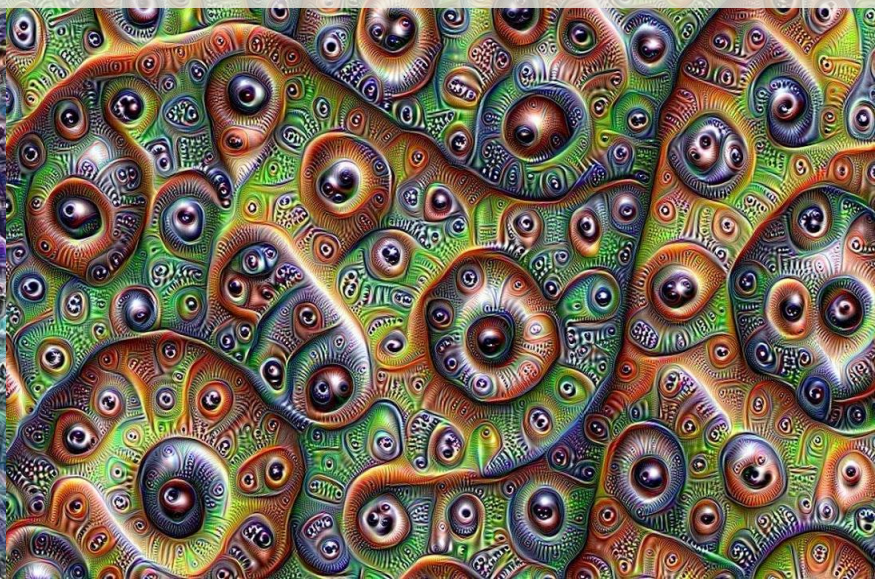


## Drones: \$98 Billion by 2025





# June 2015: Google Deep Dream





# Nov. 2015: Synthetic Bedrooms



## Unsupervised Representation Learning with Deep Convolutional Generative Adversarial Networks

Alec Radford, Luke Metz, Soumith Chintala

(Submitted on 19 Nov 2015)

[https://github.com/Newmu/dcgan\\_code/tree/gh-pages](https://github.com/Newmu/dcgan_code/tree/gh-pages)



# Nov. 2015: Synthetic Record Albums





# Nov. 2015: NeuralTalk and Walk Demo

a man is eating a hot dog in a crowd



a boat is parked on the side of a river



a view of a street from the side of a road



a man riding a skateboard down a street





# Safety

- Future of Humanity Institute
- Machine Intelligence Research Institute
- Self-Aware Systems
- Centre for the Study of Existential Risk
- Future of Life Institute
- Institute for Ethics and Emerging Technologies
- OpenAI



# Learn More!

- Lots of free resources:
- Open Source: <https://www.tensorflow.org/>
- Tutorials: <http://deeplearning.net/>
- Online Natural Language Course:  
<http://cs224d.stanford.edu/>
- Online Vision Course:  
<http://vision.stanford.edu/teaching/cs231n/>

# The Future Looks Bright!

- \$50 trillion of value
- Hundreds of startups
- Billions of investment
- Rapid performance improvement
- Free and cheap software
- Rapidly improving hardware
- Many innovative applications
- Lots of work on safety
- Opportunity to improve the world